TO IDENTIFY PREOPERATIVE AND INTRAOPERATIVE FACTORS THAT INFLUENCE DEVELOPMENT OF SYSTEMIC INFLAMMATORY RESPONSE SYNDROME (SIRS) FOLLOWING PERCUTANEOUS NEPHROLITHOTOMY

Dissertation submitted to

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for the award of the degree of

M.Ch (UROLOGY) – BRANCH – IV

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DECLARATION

I solemnly declare that this dissertation titled "**To identify preoperative and intraoperative factors that influence development of systemic inflammatory response syndrome (SIRS) following percutaneous nephrolithotomy(PCNL)"** was prepared by me in the Department of Urology, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai - 3 under the guidance and supervision of Prof.R.Jeyaraman, M.S., M.Ch (Uro)., Professor & Head of the Department, Department of Urology, Rajiv Gandhi Government General Hospital, Chennai. This dissertation is submitted to The Tamil Nadu Dr. MGR Medical University, Chennai in partial fulfillment of the university requirements for the award of the degree of M.Ch. Urology.

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Place: Chennai
Date

CERTIFICATE

This is to certify that the dissertation titled **"To identify preoperative and intraoperative factors that predict the development of systemic inflammatory response syndrome (SIRS) following Percutaneous nephrolithotomy (PCNL)**" submitted by **Dr.Dhinakar Babu.N,** appearing for **M.Ch. (Urology)** degree examination in August 2013, is a bonafide record of work done by him under my guidance and supervision in fulfillment of requirement of The Tamil Nadu Dr.M.G.R.Medical University, Chennai. I forward this to The Tamil Nadu Dr.M.G.R.Medical University, Chennai.

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INTRODUCTION

Urinary stone disease has been known to affect humans since antiquity.

The incidence of stone disease has shown migration with regard to site of stones from lower to upper. Also even though stone disease is two to three times more common in young adult males in comparison to females the gender divide is fast disappearing.

The prevalence of renal stone disease is estimated to be varying around 1% to 15%.It was found that the prevalence in males is 10% and in females is 4% by Soucie et al[1].The disease is more common in whites compared to Asians and Afro-Americans.

The peak age incidence of stones is in the fourth to sixth decades of life. Stones are more common in hot arid climates, obese individuals and in those with sedentary life style.

Hippocrates described the symptoms of renal colic as

"An acute pain is felt in the kidney, the loins, the flank and the testis of the affected side; the patient passes urine frequently; gradually the urine is suppressed. With the urine, sand is passed."

The management of stone disease has also evolved in parallel to development in evaluation and imaging. Early open procedures have given way for less invasive endourological management with reduced morbidity and mortality.

Percutaneous nephrolithotomy is considered the standard of care in the management of renal calculous disease. In the early days the procedure had considerable morbidity and at times mortality.

With advances in technology and improved surgical technique the mortality is very low and morbidity has come down. Sepsis remains one of the dreaded complications of the procedure. We need factors to predict who all are more likely to develop sepsis so that we can aggressively manage those patients from the preoperative period itself and avert the dangerous complications from occurring.

In this endeavour, analysis of both preoperative and intraoperative factors are essential to identify the risk factors since both can play a role in the development of sepsis.

AIM AND OBJECTIVE

To analyse prospectively the preoperative and intraoperative factors that predict the occurrence of systemic inflammatory response syndrome in patients undergoing percutaneous nephrolithotomy for renal calculus disease.

REVIEW OF LITERATURE

The management of stone disease can be divided broadly into medical and surgical management.

Medical management is done in patients with very minimal stone burden and who are asymptomatic. It is also useful in certain types of stones to prevent recurrence.

In early days medical management didn't find favour due to inadequate understanding of the basic pathogenesis of stone formation.

With advances in technology and better understanding of the basic pathogenesis of stone formation, medical management has started playing increasing role in the management of stone disease. Also at the same time there is an intensely felt need to tackle the recurrence of stones inspite of successful surgical management of stone disease.

Surgical management is the main stay of treatment in many patients. The evolution of surgical management of stone disease dates back to several centuries.

Ancient literatures point that surgical management was attempted with increasing vigour in the management of stone disease inspite of high morbidity and sometimes mortality.

Eric Riches described the removal of urinary tract stones in Egypt as follows:

"The urethra was dilated by a wooden or cartilaginous cannula as thick as the thumb pushed in with great force alternating with blowing down the urethra; the stone was pressed down into the perineum by the fingers in the rectum until it could be reached from the urethra or sucked out by the mouth[4]".

MEDICAL MANAGEMENT

The role of medical management of stone disease has evolved to the present state over the years. Scientific advances and better understanding of the pathophysiology of stone formation has helped in its development.

Hence it is recommended that some form of medical management has to be recommended for all stone disease patients irrespective of the etiology of the disease.

ROLE OF FLUID INTAKE

The mainstay of this conservative approach is advice to achieve an urine output of 2 litres per day.This increased urine output resulting in mechanical diuresis thereby preventing stagnation of urine and stone formation.It also results in formation of dilute urine that alters the supersaturation of various stone forming components of urine[3].

Hosking et al described the so called “Stone clinic effect” in single stone formers which revealed that increasing fluid intake resulted in reduced recurrence rate [2].

It was also found that type of water intake with regard to hardness of water did not play a significant role in predisposing to stone formation.

Carbonated beverages particularly those acidified with citric acid was found to offer protection against stone formation. Juices containing citrate like lemonade and orange were also protective[3].

Various studies have concluded that it’s not the type of fluid ingested that is important but only the absolute amount of fluid matters. Hence it is advisable to take a intake of minimum 3000ml/day to maintain output of 2500ml/day.

ROLE OF DIET

Recent studies have thrown more light on the role of dietary modifications needed in stone disease prevention. The increasing stone disease prevalence in females can be explained by the predominant role played by diet.

Increased animal protein consumption predisposes to stone formation. Studies have shown that four times higher incidence of stone diseases in northern and western India in comparison to eastern and southern parts is attributed to increased consumption of animal protein. Increased protein intake results in excess excretion of calcium ,uric acid and oxalate in urine predisposing to stone formation.

Dietary sodium restriction is another important means of reducing stone recurrences[5]. High sodium consumption results in increased urinary levels of sodium, calcium and pH and decreased citrate level. The ultimate effect is increased crystallization of calcium in urine. Hence moderate sodium restriction will help in preventing recurrence[8].

Moderate intake of calcium is recommended in patients with calcium stone formation. Since severe restriction of calcium leads

to increased oxalate absorption resulting in calcium oxalate supersaturation calcium supplementation in moderate amounts is recommended[7].The type of calcium being supplemented also matters in that calcium in the form of calcium citrate is more stone friendly supplement[7].

Avoiding oxalate and restricting vitamin c intake to less than 2 gram per day are advised for those prone for oxalate stone formation.

Selective medical treatment is more effective in preventing recurrence. It can be followed for certain specific types of stones. Selective therapy like citrate for hypocitraturic patients , increasing urinary pH by alkalinizing urine, agents to increase cystine solubility like mercaptopropionylglycine,D-penicillamine or captopril, urease inhibitor acetohydroxamic acid in infective stones and avoidance of drugs causing drug induced stones can be tried.

Persons with increased body mass index have higher incidence of stone diseases .This propensity is more for females than males. Metabolic syndrome has been shown by various studies to predispose to stone formation

SURGICAL MANAGEMENT

Surgical management of stone disease can be divided broadly into open procedures and endourological management.

OPEN PROCEDURE

French archer of Bagnolet reported the first surgical attempt to remove renal stone. He claimed removal in a condemned individual who had a renal calculus. He was offered an incentive of being freed if he subjects himself to the crude procedure then. Its history that he got freed from both after his surgery in 1474.

In 1550 Cardan of Milan operated on a teenage girl with lumbar abscess and removed 18 calculi which was documented. At that time the concensus was to operate only in patients with kidneys infected by calculous disease.

In 1734 Lafite drained an abscess through the loin. But the persistent drainage of pus made him to extend the original incision and he ultimately removed two calculi. He also treated a patient with urinary fistula due to renal calculous disease. He proposed that treating the underlying etiology will relieve the patient of his symptoms.

In 1872 William Ingalls explored the persistent fistula tract with a forceps and extracted a calculus from the kidney being the first nephrolithotomy in Boston,USA.[10]

In 1880 Henry Morris performed the first nephrolithotomy in England by removing a mulberry calculus.

As the technique got evolved they tried to reduce the haemorrhagic complication by trying different incisions.In 1879 Heineke popularized the pyelotomy incision which was favoured by all.The main drawback of the incision is its inability to extend the incison for larger calculi to be extracted.

Further attempts at reducing the complications led to the discovery of an avascular plane just posterior to the convex border of the kidney described by Josef Hyrtl, in 1882, and Max Brödel, in 1902.It goes by the name “Brodels bloodless line or white line” (Schultheiss et al, 2000)[8].

Inspite of all the advances still complications occurred. ZuckerKandl demonstrated an extension of pyelotomy incision into lower pole producing an inferior nephropyelolithotomy. Another innovation was a V incision into the poles. Other options tried were

control of vessels by hilar compression and innovative suturing techniques.

In 1887 Czerny described an innovative suturing technique to control bleeding and also to reduce the development of pyelocutaneous fistula formation.

Guyon described the ill effects of nephrectomy as treatment for calculous pyonephrosis particularly in bilateral stone disease eventhough nephrectomy is easier to perform in comparison to stone extraction.

In 1889 Kummell performed the first nephron sparing surgery for stone disease .In 1913 Lower suggested pyelolithotomy is safer and easier method than nephrolithotomy. A study by Murphy et al in 1972 showed that there is no difference in recurrence rate between nephrolithotomy and pyelolithotomy contrary to popular belief then. Hence pyelolithotomy was the preferred procedure.

Dees and Fox described removal of stones by using a coagulum made from combination of fibrinogen and thrombin. The coagulum was introduced into renal pelvis forming a cast of it. The risk of transmissible infection limited its use (Marshall, 1983).Fischer et al in 1980 used cryoprecipitate as the source of

fibrinogen to form coagulum. It was safe and also easily available[11].

Landmark development in the management of stone disease by surgical approach is the description of extended pyelolithotomy by Gil Vernet in 1965.This pioneering surgery became procedure of choice for large and complex calculi.It has wide application and acceptable minimal morbidity. It was further improved by combining with nephrotomies in radial directions if needed.

Smith and Boyce in 1968 proposed a procedure of approaching via an incision through the bloodless field.This procedure went by the name " Anatrophic nephrolithotomy" since the procedure didn't interfere with the blood supply to parenchyma and hence no atrophy of parenchyma.This permits successful stone removal ,restoration of calyceal anatomy and capsular integrity resulting in good preservation of renal function.Since morbidity of the open procedure remained a considerable problem the quest for better approach continued.

ENDOUROLOGY IN STONE DISEASE

Endourology was defined by Arthur Smith as "closed controlled manipulation within the genitourinary tract".

In 1979 Wolf introduced the very first rigid endoscope for use in urology.

The development of rod lens system by Harold Hopkins led to the creation of progressively smaller ureteroscopes with improved clarity and better working channels.

Further developments in the field of endourology was heralded by the development of various energy sources used to fragment calculi intracorporeally.

The foremost thing in the success of percutaneous nephrolithotomy is the gaining of access into the collecting system.

Thomas Hillier in 1865 established the first therapeutic percutaneous nephrostomy (Bloom et al, 1989).

PERCUTANEOUS NEPHROLITHOTOMY

Following this development percutaneous access was utilized for calculous removal from the kidney by Swedish urologist B. Johannson and Fernstrom a radiologist,being the first percutaneous nephrolithotomy in1973 and subsequently reported it in 1976[13].

The original procedure was not a single step one as we do now. It was done over twenty days. Initially a percutaneous access

tract to the pelvicalyceal system was established . A series of polypropylene semirigid dilators were warmed over steaming water to progressively increasing size. The final tract achieved was 20 Fr in size. They waited for two weeks for the tract to mature. They used a dormia basket to extract the calculus from the kidney. Thus the first successful percutaneous extraction of stone from kidney was done. But the time taken was too long and procedure was tedious for the patient and doctor.

Pioneers in the field like Peter Alken, Michael Marberger, Wickham, Ronald. A.Miller, Joseph Segura and Ralph Clayman improved the way of accessing the pelvicalyceal system[14].

ACCESS TO THE COLLECTING SYSTEM

A good knowledge about both renal and perirenal anatomy is vital in gaining an access which should be also both safe and useful. Variations in the anatomy particularly the mobility of kidney with respiration still poses challenges in obtaining an access.

A thorough knowledge about the relative location of both kidneys in relation to vertebral bodies and their orientation and tilt in relation to the spine are essential for success.

The real risk to the pleura and sometimes the lung particularly in gaining access to the upper calyceal system should be kept in mind.

There exists risk to the colon particularly in patients with retro renal colon. It is more common in the left side in thin individuals particularly females.

The collecting system anatomy is also equally important for successful access. The outermost part of collecting system is minor calyx. This minor calyx join to form major calyx which drains into the pelvis through infundibulum. This infundibular part may be a limitation in patients with narrowing in gaining access into the pelvis[15].

The minor calyx draining a single papilla are called simple whereas those draining more than one papilla are complex .Complex calyces are more common in poles. Also the simple calyces are oriented in two rows located either anteriorly or posteriorly.[15]

The orientation of these calyces is important to determine the best access tract. The anteroposterior orientation also varies with side.

There are two types of orientations described. In the Brodel type the posterior calyces form an angle of 20 degree with the frontal plane meaning posterior calyces are lateral. In the Hodson type the posterior calyx form an angle of 70 degree with the frontal plane meaning posterior calyces are medial.

Brodel type is more common in the right side while Hodson type is more common in the left side.

Extensive studies have shown that posterior calyceal puncture through the fornix is the ideal site for entry to gain access with minimal complications. So the preferred approach is through the posterior calyx and the level being decided by the location of the calculus within the kidney. Subcostal access is the safest level to enter.[16]

ROUTES OF ACCESS

Gaining access into the upper tract collecting system can be achieved by both antegrade and retrograde methods. Antegrade access is indicated in performing procedures like percutaneous endopyelotomy endoureterotomy nephrolithotomy, calyceal diverticula,hydrocalyces, and antegrade ureteroscopic treatment of

large ureteral stones, percutaneous resection of urothelial tumors and management of fungal bezoars.

ANTEGRADE ACCESS

Antegrade access is the standard of approach for establishing a percutaneous tract. 21 G or 18 G needle is inserted into the collecting system under either fluoroscopic or ultrasonic guidance. Guidewire is passed into the system.

The tract is established by dilating using rigid metal dilators introduced by Alken .These coaxial stainless steel dilators are passed over a rigid guide rod.The ball tip prevents overshooting of dilators. It is especially suitable for patients with dense fibrous tissue surrounding the kidney. It also causes more trauma to surrounding tissue.

Other option is polyurethane semirigid Amplatz dilators. The dilatation is done in increments of 2 Fr and the dilator has to be removed before inserting the next higher dilator. The advantage is lesser trauma to tissues. But disadvantage is risk of bleeding when everytime dilator is pulled out for next insertion.[17]

To overcome the difficulties with these two methods balloon dilators came into use .But balloon dilators are expensive. Also they are less useful in densely scarred tissue.

Recently single step dilatation techniques are available using semi rigid plastic dilator, rigid dilator with sheath and balloon dilator with an expandable sheath.[18]

Antegrade access is established under ultrasonographic or fluoroscopic guidance.[19] Even today blind puncture is being practiced.

Access under ultrasonography guidance was introduced by Pedersen in 1974.Advantages include use of portable machines and absence of radiation .Disadvantages are operator dependability, difficulty visualizing the needle and further monitoring being difficult.

Fluoroscopic guidance is commonly used. Two different methods are “eye of the needle” technique and “triangulation technique”.[20]

RETROGRADE ACCESS

Retrograde access is helpful in obese patients, anomalously located kidneys and hypermobile kidneys. Retrograde transurethral

access is established by placing a 5 or 6 Fr ureteric catheter. Contrast is injected into the pelvicalyceal system to delineate and dilate the system. Guidewire is introduced into the system and can be brought out through the percutaneous tract by grasping it with the nephroscope.

Ureteroscope can also be used to establish a tract with retrograde assistance.

POSITIONING OF PATIENT

Proper positioning of patient for the procedure is vital. Prone position was initially used by Goodwin in 1955 in creating percutaneous access. Commonly the prone position is preferred since posterior calyceal puncture is easier in this position. Also it provides a wider area of access and a stable work surface.

Disadvantages include decrease cardiac index, diminished pulmonary capacity if not padded properly, neuromusculoskeletal complications, ocular injury ,rhabdomyolysis and difficulty controlling the airway.[21]

To overcome this difficulty supine position was introduced by Valdivia Uria in 1987. Anterior calyces were entered through a lateral or anterolateral approach.[22]

Advantages are the access sheath angle is horizontal allowing fragments to wash out due to reduced pressure within the collecting system. Also no repositioning is required during the procedure with easier access to the urethra.

Disadvantages are unfamiliar procedure, low collecting system pressure and hence poor visualization .Also upper pole access in supine position is difficult.

Other variations in position like supine with same side elevation, supine with same side flank elevation and asymmetry lithotomy position and flank position.

Following successful fragmentation and retrival of stones a nephrostomy is kept along with a ureteral stent or catheter. Now tubeless procedure in the form of not keeping a nephrostomy in patients in whom complete clearance has been achieved is being done.[25] Still one step ahead is totally tubeless in which ureteric stent also is avoided.[26]

In order to prevent development of infectious complications a preoperative sterile urine is always optimal .But this may be difficult to achieve in certain situations like abnormality in anatomy, recent hospitalization, other infective foci in the body and patients already

on catheter. They require urine culture and appropriate treatment. It is standard practice to do urine culture in patients with staghorn calculus and those on percutaneous drainage catheter. In all other situations a urine analysis is adequate. Culture is required if analysis is abnormal. A full course of antibiotics is given when culture is positive. The American Urological Association recommends periprocedural antimicrobial prophylaxis for all cases of percutaneous renal surgery (Wolf et al, 2008).[23]

Nonrandomized trials show a infection rate of 35% to 40% if no antimicrobial prophylaxis is used compared with 0% to 17% if prophylaxis is used (Charton et al,1986; Darenkov et al, 1994).[24]

Prophylaxis recommended include first or second generation cephalosporins along with aminoglycosides which can be replaced with aztreonam in situations of elevated renal parameters. In addition either metronidazole or clindamycin or a fluoroquinolone can be added.

In case of prophylaxis a course for one day is advised.

COMPLICATIONS OF PERCUTANEOUS NEPHROLITHOTOMY

Even though percutaneous nephrolithotomy is a very effective procedure in treating calculous disease it is not without complications.

Haemorrhage is the most common complication of percutaneous surgery. 0.5 -4% of patients require blood transfusion following percutaneous nephrostomy alone due to haemorrhage.[27] When percutaneous nephrolithotomy was also done it increased to 6 -20%.[18]

Mostly the source of haemorrhage is from parenchymal vessels. Intraoperatively the access sheath acts as a tamponade .Post procedure if there is bleeding it is better to insert and keep the nephrostomy tube occluded. Also we can compress the incision and remove the clots from the collecting system. If still not controlled it requires selective angio embolization.[28]

1% of patients develop delayed haemorhage which is mainly due to arterio venous fistulas or pseudoaneurysms. Angiography and selective embolization is needed to treat them.

Recently placement of endovascular stent across the bleeding vessel and injection of thrombin or tissue adhesive under ultrasonographic guidance have been tried with success.[29]

Collecting system injury like pelvic perforation can occur. It is identified by sudden collapse of renal pelvis. It can lead to

massive extravasation of fluid. The procedure is stopped with both nephrostomy and ureteral stent being placed.[30]

Visceral injury to colon,duodenum and jejunum can occur. Extraperitoneal colonic injury are managed conservatively by prompt and separate drainage of colon and kidney.[31] Intraperitoneal injury needs to be repaired. Liver and splenic injuries are very rare.

Pleural and lung injuries can occur particularly when supracostal access is being done. When identified they require a costal drainage.[32]

Metabolic and electrolyte imbalances can occur when normal saline used for irrigation gets extravasated. Venous gas embolism can occur which is fatal.

Post procedure fever can occur in 15 -30% of patients. Inspite of antibiotic prophylaxis systemic inflammatory response syndrome occurs. 1-2 % of these patients develop frank sepsis.

Studies have shown that treating bladder culture alone is not sufficient in preventing sepsis. Sepsis have occurred in patients with preoperative urine culture showing no growth.

It is not possible to predict which of the febrile patients progress to sepsis. Hence there is a need to predict who all will develop systemic inflammatory response syndrome and thus by treating them with appropriate full course of antibiotics we can prevent the development of sepsis in these patients undergoing percutaneous nephrolithotomy.[33]

MATERIALS AND METHODS

TITLE OF STUDY

To identify preoperative and intraoperative factors that influence development of Systemic Inflammatory Response Syndrome (SIRS) following Percutaneous Nephrolithotomy (PCNL).

PERIOD OF STUDY

APRIL 2012 TO MARCH 2013.

STUDY DESIGN

Prospective study

PLACE OF STUDY

Department of Urology, Madras Medical College, Chennai.

ETHICAL CLEARANCE

The Institutional Ethics Committee of our college approved the study. No -12042012.

INCLUSION CRITERIA

All patients with renal stone disease who underwent Percutaneous Nephrolithotomy in our Institution.

EXCLUSION CRITERIA

1) Patients with infected collecting system.

2) Patients with synchronous ureteric stones

3) Patients on stents or PCN drainage.

METHOD OF STUDY

All patients who presented to our Department with renal stone disease were evaluated with physical examination, urine analysis, urine culture and sensitivity , complete blood count , renal function test , X ray KUB, and Plain and contrast enhanced computerised tomography.

All patients were subjected to Percutaneous nephrolithomy after obtaining anaesthetic fitness.

All patients were administered 1 gm of ceftriaxone and 500 mg of amikacin as standard antibiotic prophylaxis for a period of three days including one preoperative dose. Patients with preoperative serum creatinine greater than 1.4 were not administered amikacin.

All patients underwent PCNL under general anaesthesia. Patients were placed in lithotomy position and a 5 Fr ureteric

catheter was introduced. Contrast was used to identify the collecting system and to select the calyx for puncture.

After prone positioning with adequate padding posterior calyceal puncture was done under fluoroscopic guidance. Level of puncture was decided as per location of stone to ensure complete clearance.

Puncture was done using 18 G three part needle and guide wire was placed within the system. Guide rod was introduced and serial coaxial dilatation of tract done with Alkens metal dilator. Amplatz sheath was placed. Using 26 Fr Karl Storz nephroscope and Karl Storz pneumatic lithotripter stone fragmentation was done.

After fragments were evacuated antegrade 4 Fr ureteric stent is placed. A 20 Fr nephrostomy tube it also placed.

Intraoperative parameters like operative time,no of access tracts used and need for blood transfusion were recorded. Pelvic urine collected on puncture and stone were sent for culture and sensitivity.

Patients were followed up in postop period with daily complete blood count including White blood cell count, serial pulse rate, temperature and respiratory rate monitoring.

Post procedure check Xray KUB was taken before removing the nephrostomy tube in the first postoperative day. Ureteric stent was removed after 14 days.

Patients who developed any two or above of the following in the postoperative period were considered to have developed systemic inflammatory response syndrome (SIRS).

1) Temperature >100.4^0 F (38^0 C) or < 96.8^0 F (36^{0}C).

2) Pulse rate > 90/min.

3) Respiratory rate >20/min.

4) WBC count >12000/ml or < 4000/ml.

STATISTICAL ANALYSIS OF THE STUDY

For discrete data proportion are computed and the mean and standard deviation are computed for the continuous data. The chi square test was applied to compare the proportions between the groups. To examine the association between the outcome (SIRS) and several variables logistic regression analysis was done. All analyses were two tailed and $p < 0.05$ was considered significant. Statistical package for social sciences (SPSS) version 16.0 was used for data analysis.

OBSERVATION AND RESULTS

DESCRIPTIVE STATISTICS

A total of 120 patients underwent Percutaneous Nephrolithotomy in our Institute during the study period . All the patients were evaluated both preoperatively and postoperatively as described above. Of these 120 patients 29(24.1%) of them developed features of systemic inflammatory response syndrome in the postoperative period.

The patient characteristics are shown as below.

FREQUENCIES

Table-1 :Showing basic characteristics of study population.

		Age	Sr. Creatinine	Stone size	OP time	No of tracts
N	Valid	120	120	120	120	120
	Missing	0	0	0	0	0
Mean		42.18	1.196	2.893	70.32	1.10
Std. Deviation		11.794	.6076	.5264	19.516	.301
Minimum		18	.6	2.2	40	1
Maximum		65	3.4	5.1	125	2

GENDER OUTCOME

Tab-2: Gender distribution Crosstab

			outcome_gp		Total
			No SIRS	**SIRS**	
sex	Male	Count	56	17	73
		% within sex	76.7%	23.3%	100.0%
	Female	Count	35	12	47
		% within sex	74.5%	25.5%	100.0%
Total		Count	91	29	120
		% within sex	75.8%	24.2%	100.0%

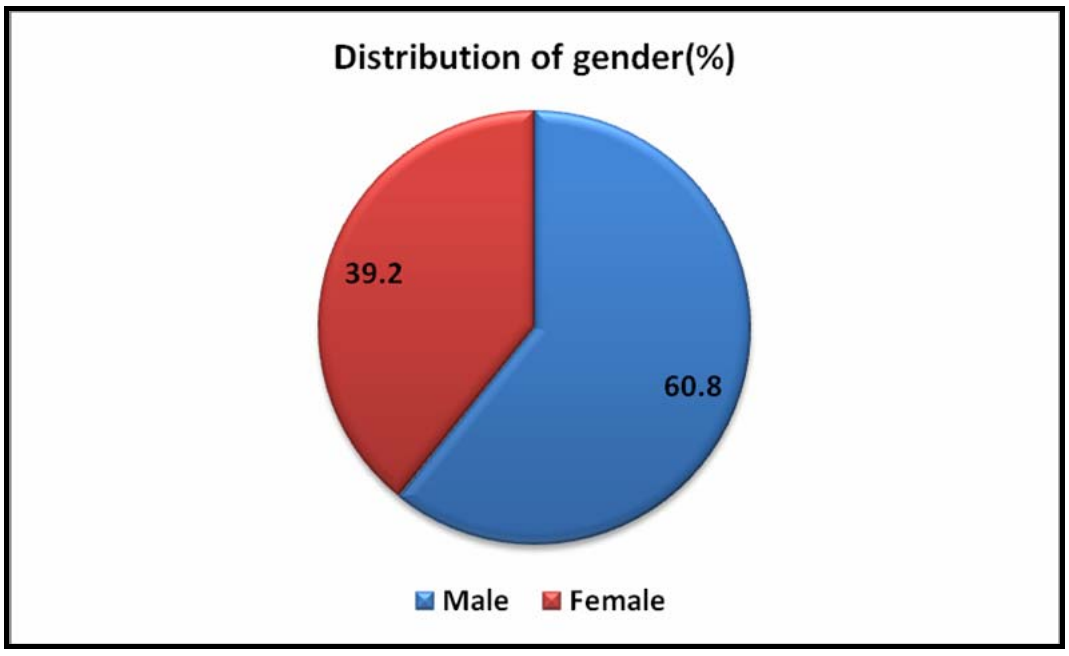

Fig 1. Gender distribution.

Tab-3: Gender distribution analysis Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.079a	1	.779		
Continuity Correctionb	.004	1	.951		
Likelihood Ratio	.078	1	.780		
Fisher's Exact Test				.829	.472
Linear-by-Linear Association	.078	1	.780		
N of Valid Casesb	120				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.36.

b. Computed only for a 2x2 table

In this study of 120 patients 73 (60.8%) of them were males and 47 (39.2%) were females(fig 1).. Among the males 17(23.3%)developed SIRS and 56 (76.7%) didn't develop SIRS. Among the females 12 (25.5%) developed SIRS and 35 (74.5%) didn't develop SIRS(tab 2).

On statistical analysis using Chi square test it was found that the gender distribution between those who developed SIRS and those who didn't develop was not statistically significant (p= 0.829)(tab 3).

DIABETES MELLITUS

Tab-4: Distribution of diabetes mellitus Crosstab

			outcome_gp		Total
			No SIRS	**SIRS**	
DM	Yes	Count	23	13	36
		% within DM	63.9%	36.1%	100.0%
	No	Count	68	16	84
		% within DM	81.0%	19.0%	100.0%
Total		Count	91	29	120
		% within DM	75.8%	24.2%	100.0%

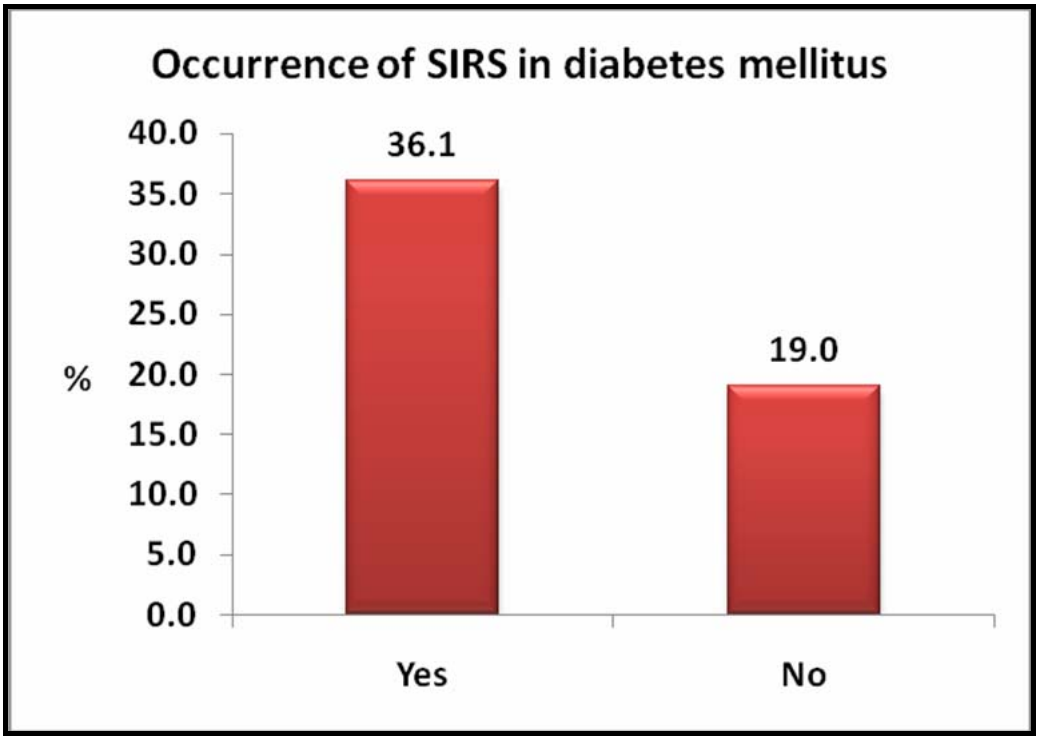

Fig 2. SIRS in diabetes mellitus.

Tab-5: Analysis of SIRS and Diabetes mellitus Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.004a	1	.045		
Continuity Correctionb	3.127	1	.077		
Likelihood Ratio	3.825	1	.050		
Fisher's Exact Test				.062	.041
Linear-by-Linear Association	3.970	1	.046		
N of Valid Casesb	120				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.70.

b. Computed only for a 2x2 table

In this study the number of patients who had diabetes mellitus was 36 (30%) and 84(70%) didn't have diabetes mellitus. Of the patients who developed SIRS 13 (36.1%) had diabetes mellitus and 16 (19%) didn't have diabetes mellitus(tab 4)(fig 2).

The proportion of patients who developed SIRS was found to be relatively higher in those who had diabetes mellitus compared to non diabetics. But the difference between them was statistically insignificant (p=0.062)(tab 5).

BLADDER URINE CULTURE

Tab-6: Bladder urine culture Crosstab

			outcome_gp		Total
			No SIRS	**SIRS**	
BU_CS	Growth	Count	42	18	60
		% within BU_CS	70.0%	30.0%	100.0%
	Sterile	Count	49	11	60
		% within BU_CS	81.7%	18.3%	100.0%
Total		Count	91	29	120
		% within BU_CS	75.8%	24.2%	100.0%

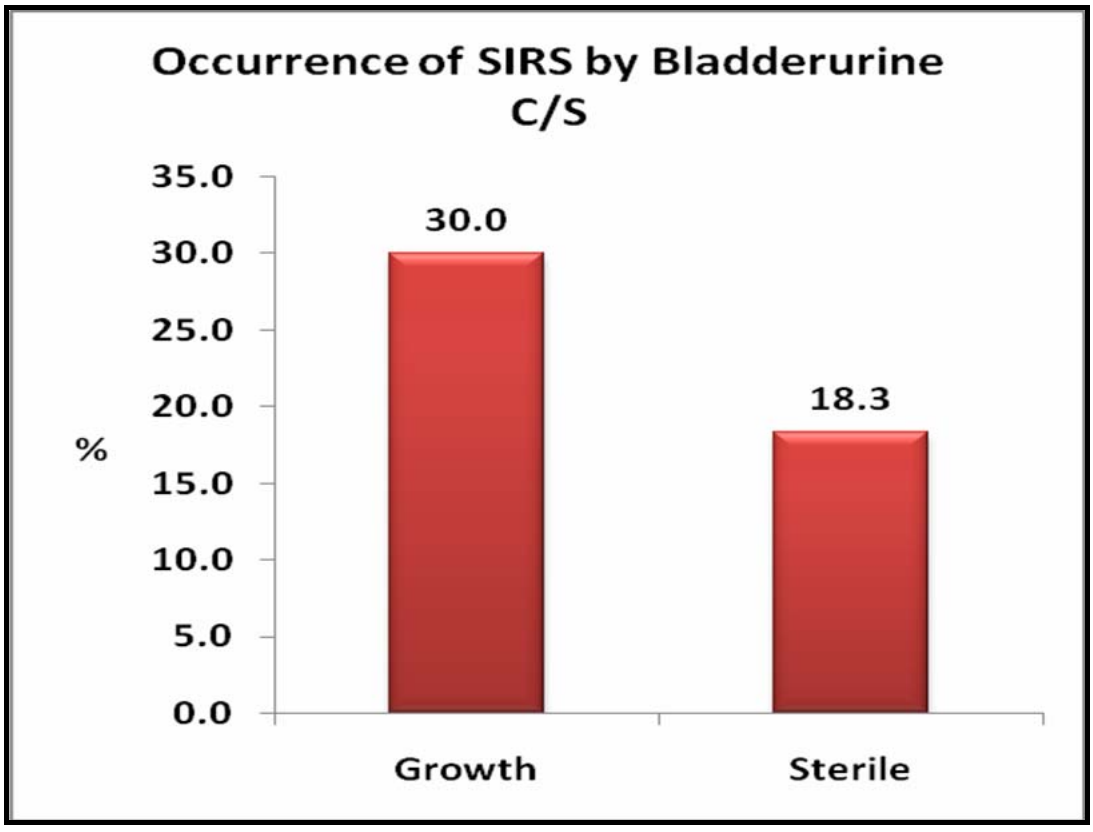

Fig 3 SIRS and Bladder urine culture

Tab-7: Analysis of bladder urine culture Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.228a	1	.136		
Continuity Correctionb	1.637	1	.201		
Likelihood Ratio	2.245	1	.134		
Fisher's Exact Test				.200	.100
Linear-by-Linear Association	2.210	1	.137		
N of Valid Casesb	120				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.50.

b. Computed only for a 2x2 table

Bladder urine culture done preoperatively showed growth in 60 (50%) patients and 60 (50%) had sterile urine. Of the 60 patients who had growth 18 (30%) developed SIRS and 11 (18.3%) with sterile urine developed SIRS (tab 6)(fig 3).

The proportion of patients who developed SIRS in those with growth in the bladder urine culture when compared with those with sterile urine was statistically insignificant (p= .200)(tab 7).

BLOOD TRANSFUSION

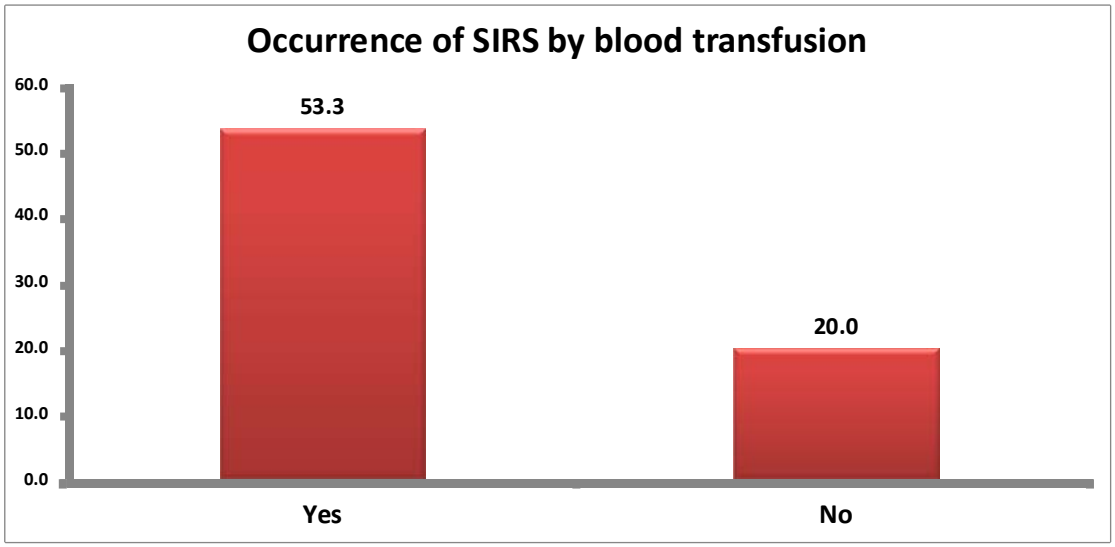

Fig 4. Blood transfusion and SIRS.

Tab-8: Blood transfusion Crosstab

			outcome_gp		Total
			No SIRS	**SIRS**	
Bloodtransfusion	Yes	Count	7	8	15
		% within bld_transfus	46.7%	53.3%	100.0%
	No	Count	84	21	105
		% within bld_transfus	80.0%	20.0%	100.0%
Total		Count	91	29	120
		% within bld_transfus	75.8%	24.2%	100.0%

Tab-9: Analysis of Blood transfusion Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.958a	1	.005		
Continuity Correctionb	6.243	1	.012		
Likelihood Ratio	6.906	1	.009		
Fisher's Exact Test				.009	.009
Linear-by-Linear Association	7.891	1	.005		
N of Valid Casesb	120				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.63.

b. Computed only for a 2x2 table

In this study the no of patients who received blood transfusion were 15 (12.5%). Of these patients 8 (53.3%) developed SIRS. 21 (20%) patients who didn't receive blood transfusion developed SIRS (tab 8) (fig 4).

On analysis it was found that the association between the patients who had blood transfusion and developed SIRS in comparison to those who didn't receive transfusion was statistically significant (p=.009) (tab 9).

NO OF ACCESS TRACTS

Tab-10: No of access tracts Crosstab

			outcome_gp		Total
			No SIRS	SIRS	
No tracts	1	Count	87	21	108
		% within No tracts	80.6%	19.4%	100.0%
	2	Count	4	8	12
		% within No tracts	33.3%	66.7%	100.0%
Total		Count	91	29	120
		% within No tracts	75.8%	24.2%	100.0%

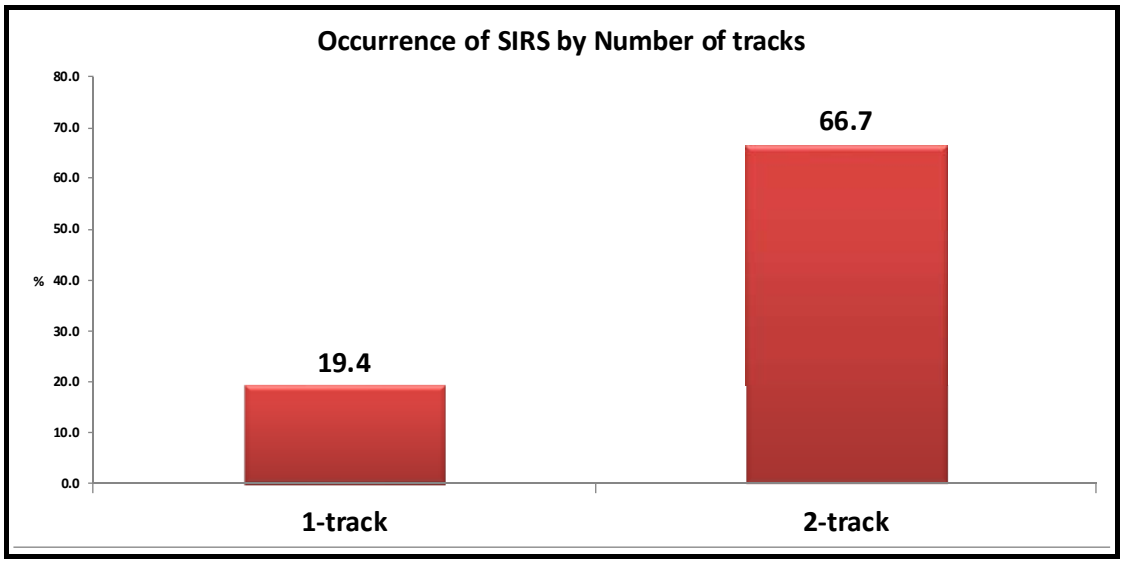

Fig-5 No. of access tract and SIRS

Tab-11: Analysis of No of tracts Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.141a	1	.000		
Continuity Correctionb	10.691	1	.001		
Likelihood Ratio	11.040	1	.001		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	13.032	1	.000		
N of Valid Casesb	120				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.90.

b. Computed only for a 2x2 table

In this study the no of patients who had one access tract were 108 (90%) and those who had two tracts were 12 (10%). Of those with one tract 21 (19.4%) developed SIRS. In patients with two tracts 8 (66.7%) developed SIRS (tab 10).

On statistical analysis the proportion of patients developing SIRS was significant (P=.001) in those with two tract access when compared with those with single tract (tab 11) (fig 5).

PELVIC URINE CULTURE

Tab-12: Pelvic urine culture Crosstab

			outcome_gp		Total
			No SIRS	**SIRS**	
PU_CS	Growth	Count	22	20	42
		% within PU_CS	52.4%	47.6%	100.0%
	Sterile	Count	59	19	78
		% within PU_CS	75.6%	24.4%	100.0%
Total		Count	81	39	120
		% within PU_CS	67.5%	32.5%	100.0%

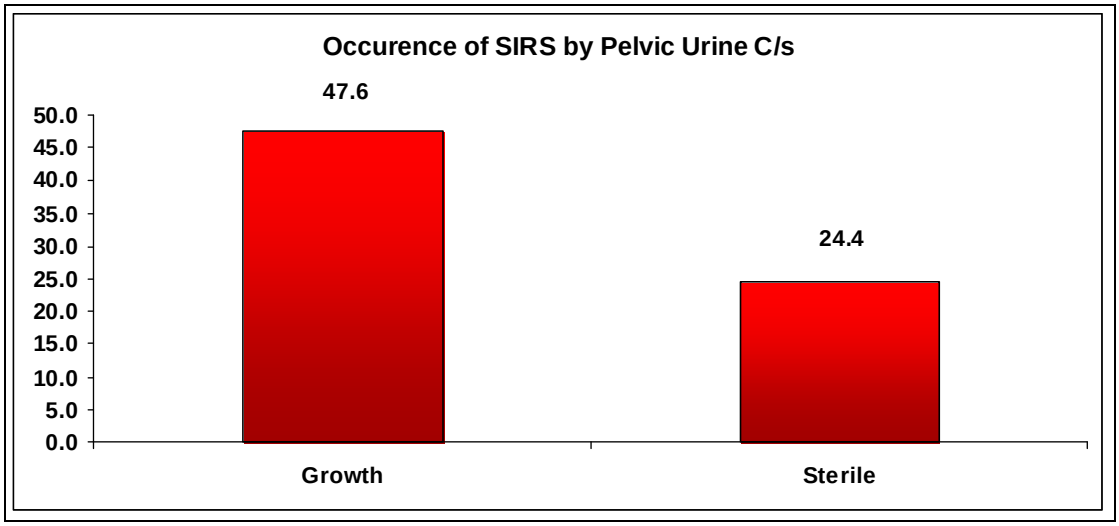

Fig 6- Pelvic urine culture and SIRS

Tab-13: Analysis of pelvic urine cultureChi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.004a	1	.0647		
Continuity Correctionb	.000	1	.0684		
Likelihood Ratio	.005	1	.0946		
Fisher's Exact Test				.0467	.0567
Linear-by-Linear Association	.004	1	.0947		
N of Valid Casesb	120				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.15.

b. Computed only for a 2x2 table

In this study pelvic urine culture was positive in 42 (35%) patients. Of these patients 20(47.6%) developed SIRS. In patients with no growth in pelvic urine 19(24.4%) developed SIRS(tab 12)(fig 6).

On analysis it was found that those with pelvic urine culture positive developed SIRS more incomparison to those with sterile pelvic urine culture which was found to be statistically significant (p=0.0467).(tab 13).

STONE CULTURE

Tab-14: Stone culture Crosstab

			outcome_gp		Total
			No SIRS	**SIRS**	
stone_CS	Growth	Count	22	19	41
		% within stone_CS	53.7%	46.3%	100.0%
	Sterile	Count	61	18	79
		% within stone_CS	77.2%	22.8%	100.0%
Total		Count	83	37	120
		% within stone_CS	69.16%	30.84%	100.0%

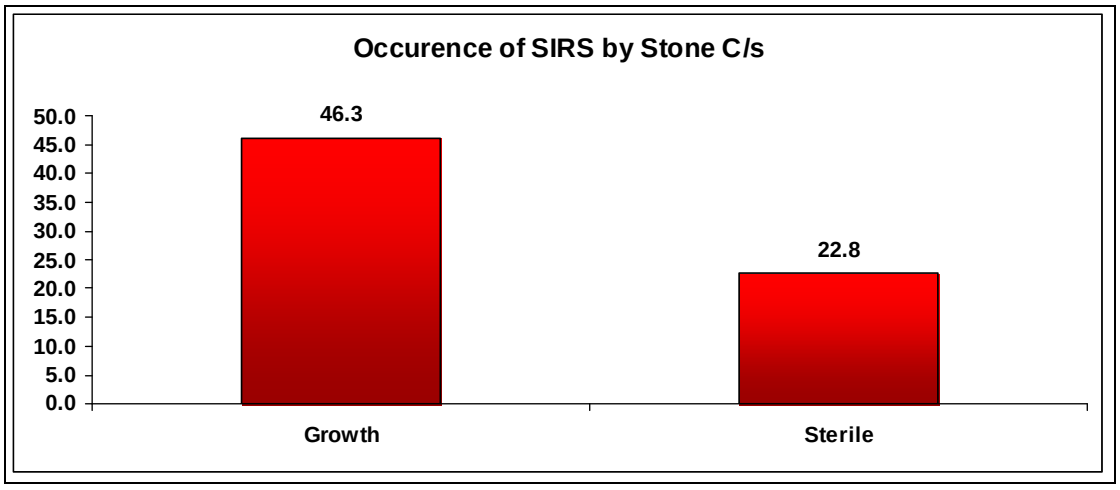

Fig 7- Stone culture and SIRS

Tab-15: Analysis of stone culture Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.241a	1	.624		
Continuity Correctionb	.071	1	.790		
Likelihood Ratio	.238	1	.625		
Fisher's Exact Test				.0389	.0391
Linear-by-Linear Association	.239	1	.625		
N of Valid Cases	120				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.91.

b. Computed only for a 2x2 table

In this study 41(34.16%) patients showed growth in stone culture of which 19(46.3%) developed SIRS. 18 (22.8%) patients developed SIRS who showed no growth in stone culture(tab14) (fig 7).

On analysis it was found that the proportion of patients who developed SIRS is significant (p=0.0389) in patients with stone culture growth in comparison to those who had no growth in stone culture(tab 15).

Tab-15 a: Analysis of bladder, pelvic and stone cultures

	BLADDER URINE CULTURE		**PELVIC URINE CULTURE**		**STONE CULTURE**	
No of cases	60/120		42/120		41/120	
ORGANISM	**No SIRS**	**SIRS**	**NO SIRS**	**SIRS**	**NO SIRS**	**SIRS**
1.E.Coli	16	6	9	6	3	2
2.Proteus	9	8	8	5	8	7
3.Klebsiella	4	2	4	-	2	1
4.Pseudomonas	6	1	3	2	5	5
5.staphylococcus	7	1	3	2	4	4
Total	**42**	**18**	**27**	**15**	**22**	**19**

In our study the number of patients who had growth in the preoperative bladder urine culture was 60 (50%). In case of pelvic urine culture 42 out of 120 (35%) had growth in the culture. In case of stone culture 41 out of 120 (34%) had growth in the culture.

On analysis it was found that the association between bladder urine culture and SIRS was statistically insignificant.

Univariate analysis revealed significant association between pelvic urine and stone culture with occurrence of SIRS.

SERUM CREATININE

Tab-16: Sr Creatinine Cross tabulation

			Outcome gp		Total
			No SIRS	**SIRS**	
Sr. creatinine gp	Abnormal (>1.4)	Count	11	7	18
		% within sr creat gp	61.1%	38.9%	100.0%
	Normal (<=1.4)	Count	80	22	102
		% within sr creat gp	78.4%	21.6%	100.0%
Total		Count	91	29	120
		% within sr creat gp	75.8%	24.2%	100.0%

Tab-17: Analysis of serum creatinine Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.505a	1	.114		
Continuity Correctionb	1.649	1	.199		
Likelihood Ratio	2.297	1	.130		
Fisher's Exact Test				.137	.102
Linear-by-Linear Association	2.484	1	.115		
N of Valid Casesb	120				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.35.

In this study 18 (15%) patients had elevated serum creatinine value .Of which 7 (38.9%) patients developed SIRS(tab16). On analysis the proportion of patients who developed SIRS with elevated serum creatinine in comparison to those with normal serum creatinine was statistically insignificant (p=0.137)(tab 17).

AGE DISTRIBUTION

Tab-18: Age distribution Crosstab

			outcome_gp		Total
			No SIRS	**SIRS**	
Age gp	<42yrs	Count	45	7	52
		% within age gp	86.5%	13.5%	100.0%
	>=42yrs	Count	46	22	68
		% within age gp	67.6%	32.4%	100.0%
Total		Count	91	29	120
		% within age gp	75.8%	24.2%	100.0%

Tab-19: Age analysis Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.738a	1	.017		
Continuity Correctionb	4.754	1	.029		
Likelihood Ratio	6.019	1	.014		
Fisher's Exact Test				.019	.013
Linear-by-Linear Association	5.690	1	.017		
N of Valid Casesb	120				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.57.

b. Computed only for a 2x2 table.

In this study the age distribution showed average age of 42 yrs(tab18). On analysis the proportion of patients developing SIRS was statistically significant in comparison between those aged above 42 yrs and below 42 years (p=0.019).(tab 19).

STONE SIZE

Tab-20: Stone size Crosstab

			outcome_gp		Total
			No SIRS	SIRS	
Stone gp	<2.893 cms	Count	69	11	80
		% within stone gp	86.2%	13.8%	100.0%
	>=2.893 cms	Count	22	18	40
		% within stone gp	55.0%	45.0%	100.0%
Total		Count	91	29	120
		% within stone gp	75.8%	24.2%	100.0%

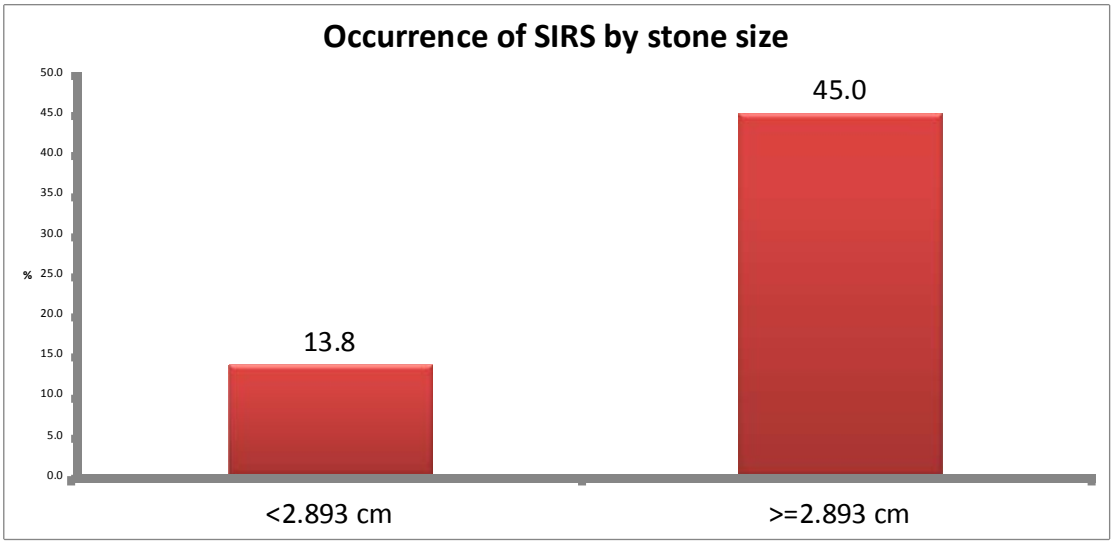

Fig 8- Stone size and SIRS

Tab-21: Analysis Stone size Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.210a	1	.000		
Continuity Correctionb	12.556	1	.000		
Likelihood Ratio	13.603	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	14.092	1	.000		
N of Valid Casesb	120				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.67.

b. Computed only for a 2x2 table

In this study the average stone size was 2.893 cms. The proportion of patients who developed SIRS in patients with stone size <2.893 cms was 11(13.8%)(tab 20)(fig 8). In the other group with stone size > 2.893 cms the number of patients who developed SIRS was 18(45%). On statistical analysis the proportion of patients developing SIRS when stone size > 2.893 cms was statistically significant (tab 21) when compared with those who had stone size < 2.893 cms.

OPERATIVE TIME

Tab-22: Operative time Crosstab

			Outcome gp		Total
			No SIRS	**SIRS**	
Optime gp	<70.32 mts	Count	63	11	74
		% within optime gp	85.1%	14.9%	100.0%
	>=70.32mts	Count	28	18	46
		% within optime gp	60.9%	39.1%	100.0%
Total		Count	91	29	120
		% within optime gp	75.8%	24.2%	100.0%

Tab-23: Analysis of Operative time Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.114a	1	.003		
Continuity Correctionb	7.838	1	.005		
Likelihood Ratio	8.927	1	.003		
Fisher's Exact Test				.004	.003
Linear-by-Linear Association	9.038	1	.003		
N of Valid Casesb	120				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.12.

b. Computed only for a 2x2 table

In this study the average operative time was 70.32 minutes. 11(14.9%) developed SIRS in the group with operative time <70.32 mins. In the group with operative time > 70.32 mins, 18(39.1%) patients developed SIRS (tab22).

On statistical analysis the proportion of patients developing SIRS in those with operative time >70.32 mins is statistically significant (p=0.004) in comparison with those with operative time <70.32 mins.(tab23).

On univariate analysis gender,diabetes mellitus ,bladder urine culture and serum creatinine were found to be statistically insignificant.

Blood transfusion, no of access tracts, pelvic urine culture, stone culture, stone size, age and operative time were found to be statistically significant.

LOGISTIC REGRESSION

Tab-24: Categorical Variables Codings

		Frequency	Parameter coding (1)
Op time_	<70.32 mts	74	.000
	>=70.32mts	46	1.000
BU_CS	Growth	60	1.000
	Sterile	60	.000
Bld_transfus	Yes	15	1.000
	No	105	.000
PU_CS	Growth	42	1.000
	Sterile	78	.000
stone_CS	Growth	41	1.000
	Sterile	79	.000
sr_creat_	Abnormal(>1.4)	18	1.000
	Normal(<=1.4)	102	.000
stone_size	<2.893 cms	80	.000
	>=2.893 cms	40	1.000
age	<42yrs	52	.000
	>=42yrs	68	1.000
DM	Yes	36	1.000
	No	84	.000

Tab-25: Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
								Lower	Upper
Step 1a	DM(1)	.481	.598	.647	1	.421	1.618	.501	5.229
	BU CS(1)	.364	.531	.469	1	.493	1.439	.508	4.077
	Bld transfus(1)	1.368	.764	3.202	1	.074	3.927	.878	17.564
	PU CS(1)	-.086	.561	.024	1	.878	.917	.305	2.756
	Stone CS(1)	-.958	.658	2.120	1	.045	.384	.106	1.393
	Sr creat gp(1)	.385	.756	.259	1	.611	1.470	.334	6.471
	Age gp(1)	.842	.604	1.944	1	.163	2.321	.711	7.582
	Stonesize gp(1)	1.498	.509	8.672	1	.003	4.473	1.650	12.124
	Optime gp(1)	1.268	.542	5.475	1	.019	3.552	1.228	10.271
	Tract	-3.238	.650	24.828	1	.000	.039		

a. Variable(s) entered on step 1: DM, BU_CS, bld transfus, PU CS, stone CS, sr craeat gp, age gp, stone gp, optime gp.

On multivariate regression analysis stone size, no of access tracts, operative time and stone culture were found to be statistically significant (Table 24,25) with regard to occurrence of SIRS.

DISCUSSION

Renal stone disease is a common urological problem. Medical management may not be possible in all situations . In certain situations like increasing stone burden or in specific type of stones like infective stones surgical management is warranted. Moreover medical management is more useful to prevent recurrences following surgical removal rather than as primary therapy.

Surgical management as described includes both open and endourological procedures. In the modern era of minimally invasive surgery renal calculous surgery is no exception.

The procedure of Percutaneous nephrolithotomy has gained wide spread acceptance and is the standard of care to treat renal calculous disease.

The procedure when attempted initially was time consuming, tedious for both patient and treating surgeon and with considerable morbidity and some mortality.

With advances in imaging, optics and improved understanding of the pathology behind the considerable morbidity the procedure has been standardized .

Initially obtaining an access was considered a vital step in the success of the procedure.

With good preoperative imaging particularly reconstructed computerised tomography, it paved way for better localization and defining the extent of calculi. Also better delineation of pelvicalyceal anatomy has helped us in obtaining an access to the pelvicalyceal system with ease.

Further understanding of the way of obtaining an access with both fluoroscopic and ultrasonographic guidance has helped us in successfully creating a tract into the pelvicalyceal system.

Even though both antegrade and retrograde techniques of access are available, the most commonly practised access is through the antegrade access.

Developments in creating a tract sufficient for the procedure has also lended a helping hand in the success of the procedure. Various methods of tract dilatation like coaxial Alken dilators, Amplatz semi rigid dilators and balloon dilators have helped in establishing a successful tract.

Advances in optics and miniaturization of endo instruments have also reduced the morbidity and improved the success rate.

Introduction of flexible instruments have also greatly improved access into all parts of collecting system without need for additional tracts.

Advances in intracorporeal lithotripters have also improved the success rate of percutaneous nephrolithotomy. Smaller size lithotripter probes and efficient retrival of stone fragments have improved the outcome of the procedure.

Inspite of all the advances and resultant improvements certain morbidities of the procedure continue to affect the patients. Even though the procedure is being done under standard antibiotic prophylaxis still patients develop postoperative fever.

The procedure is usually done after sterilizing the urine in patients with preoperative urine culture showing growth. Still 15 - 30 % of patients develop postoperative systemic inflammatory response syndrome of which 1-2% develop sepsis. The likelihood of patients developing sepsis can not be predicted as of now.

But the likelihood of developing systemic inflammatory response syndrome in patients undergoing percutaneous nephrolithotomy can be determined by identifying certain preoperative and intraoperative factors associated with the patients.

Our study comprising of 120 patients who underwent percutaneous nephrolithotomy showed that 29(24.1%) of them developed SIRS postoperatively. A study by Ruslan Korets et al showed SIRS incidence of 9.8 %.Another study by Liang Chen et el showed SIRS incidence of 23.4%.

On analysis of data collected before ,during and after surgery it showed certain factors associated significantly in developing SIRS.

Univariate analysis showed significant association between age of the patient (> 42 years) ,need for blood transfusion, stone size (> 2.893 cms), number of access tracts (1 or > 1), operative time (> 70 minutes),pelvic urine culture showing growth and stone culture showing growth.

With regard to gender distribution, diabetes mellitus, bladder urine culture showing growth and raised serum creatinine the association was found to be statistically insignificant.

On multivariate analysis only stone size, number of access tracts, operative time and stone culture were found to be statistically significant in predicting occurrence of SIRS postoperatively.

CONCLUSION

In patients undergoing percutaneous nephrolithotomy the following factors were found on analysis to be significantly associated with developing systemic inflammatory response syndrome and thereby helping to identify those likely to develop sepsis.

1) Univariate analysis showed significant association between age of the patient blood transfusion, stone size, number of access tracts, operative time, pelvic urine culture showing growth and stone culture showing growth as predictors of SIRS.

2) Multivariate analysis showed stone size, number of access tracts, operative time and stone culture as statistically significant in predicting occurrence of SIRS postoperatively.

3) In this study no statistically significant association was found between gender, diabetes mellitus,bladder urine culture and raised serum creatinine in developing SIRS postoperatively.

4) Hence patients with above identified risk factors can be given appropriate antibiotics in order to prevent the occurrence of sepsis postoperatively.

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Figure showing antegrade access

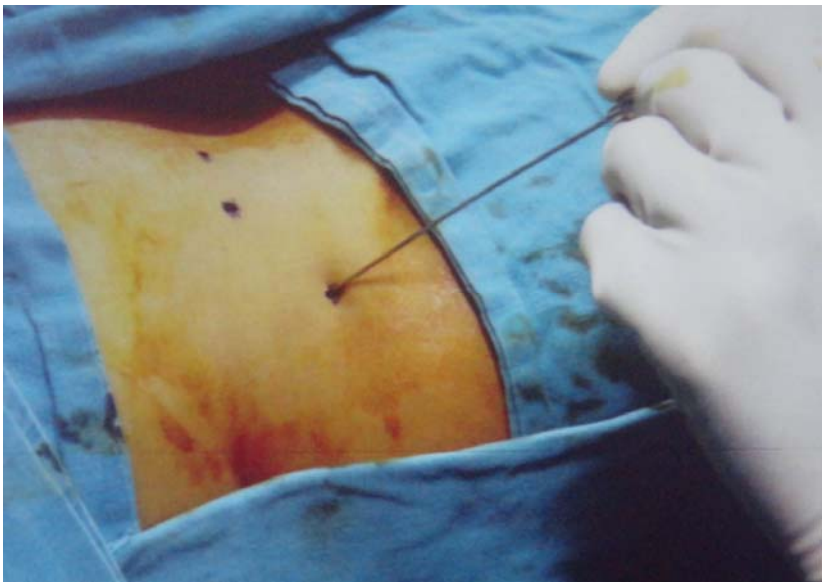
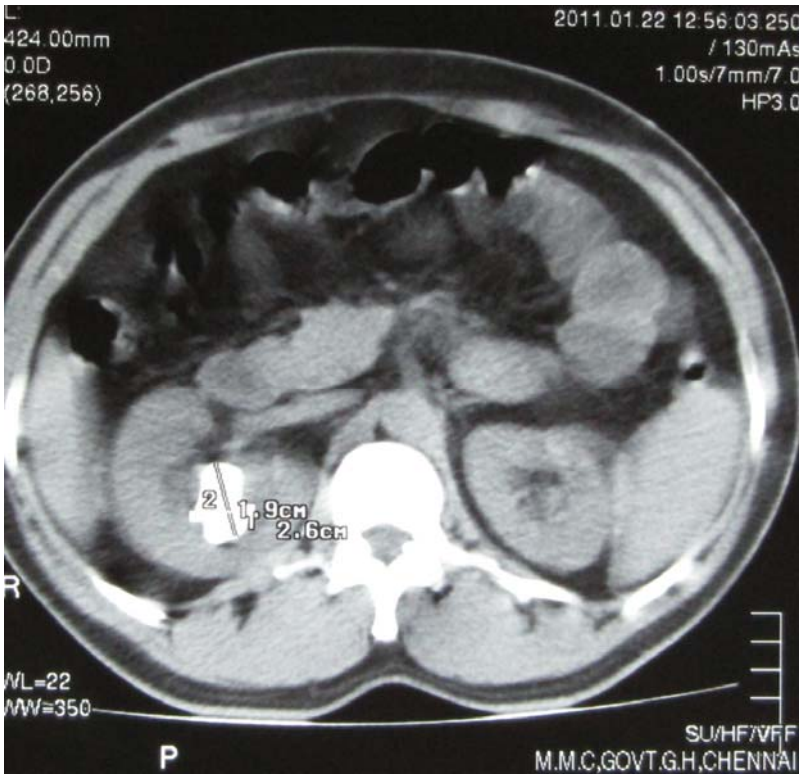
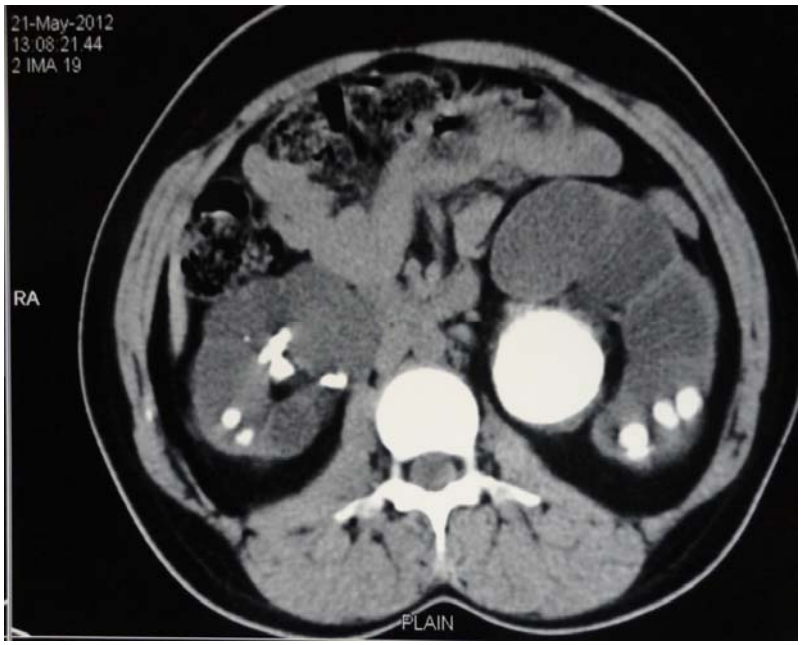


Figure showing fluoroscopic guidance

Computerized tomography showing renal calculus



Computerized tomography showing renal calculi



Nephrostomy drainage post PCNL

Figure showing antegrade access

ABBREVIATIONS

BU	:	Bladder urine.
CS	:	Culture & sensitivity.
DM	:	Diabetes mellitus
PCNL	:	Percutaneous nephrolithotomy.
PU	:	Pelvic urine.
SIRS	:	Systemic Inflammatory Response Syndrome.

Appendix

Clr W.P.No: 30,32,34,36,39,41,43,50

Clr W.O.P.No: 75-77

B&W W.P.No: 1-29,31,33,35,37-38,40,42,44-49,51-61

B&W W.O.P.No: 62-74,78-87

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. Dhinakar Babu .N
PG in MCH Urology
Madras Medical College, Chennai -3

Dear Dr. Dhinakar Babu .N

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled "To identify preoperative and intraoperative factors that influence development of systemic inflammatory response syndrome (SIRS) following PCNL" No.12042012.

The following members of Ethics Committee were present in the meeting held on 19.04.2012 conducted at Madras Medical College, Chennai -3.

1.	Dr. S.K. Rajan. M.D.,FRCP.,DSc	-- Chairperson
2.	Prof. Pregna B. Dolia MD Director , Institute of Biochemistry, MMC, Ch-3	-- Member Secretary
3.	Prof. B. Kalaiselvi MD Prof. of Pharmacology ,MMC, Ch-3	-- Member
4.	Prof. C. Rajendiran, MD Director , Inst. of Internal Medicine, MMC, Ch-3	-- Member
5.	Prof. Md. Ali. MD.DM Prof & HOD, Dept. of MGE, MMC, Ch-3	-- Member
6.	Prof.P.Karkuzhali MD Director i/c, Prof., Inst. of Pathology, MMC, Ch-3	-- Member
7.	Prof. S. Deivanayagam MS Prof of Surgery, MMC, Ch-3	-- Member
8.	Prof. A. Radhakrishnan MD Prof of Internal Medicine, MMC, Ch-3	-- Member
9.	Thiru. S. Govindsamy. BABL	-- Lawyer
10.	Tmt. Arnold Soulina MA MSW	-- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

CONSENT FORM

Study Title

TO IDENTIFY PREOPERATIVE AND INTRAOPERATIVE FACTORS THAT INFLUENCE DEVELOPMENT OF SYSTEMIC INFLAMMATORY RESPONSE SYNDROME (SIRS) FOLLOWING PCNL

I, _____ hereby give consent to participate in the study conducted by Dr.N.DHINAKAR BABU, 2nd Year M.Ch (Urology) Postgraduate Student, Madras Medical College, and Rajiv Gandhi Government General Hospital, Chennai-3 and to use my personal clinical data and result of investigation for the purpose of analysis. I also give consent for further investigations.

Signature / Thumb Impression of the patient/ relative

Place

Date

Patient Name and Address

Signature of the Investigation

PROFORMA

NAME AGE/SEX URO NO

ADDRESS

CLINICAL PRESENTATION

LOIN PAIN RIGHT/LEFT

FEVER YES/NO

DYSURIA YES/NO

PYURIA YES/NO

CALCULURIA YES/NO

HEMATURIA YES/NO

COMORBID ILLNESS

DIABETES/HYPERTENSION/TUBERCULOSIS/CAD.

PREVIOUS UROLOGICAL PROCEDURES

GENERAL EXAMINATION

GENERAL CONDITION

ANAEMIA

TEMPERATURE

SYSTEMIC EXAMINATION

ABDOMEN

CARDIOVASCULAR SYSTEM

RESPIRATORY SYSTEM

EXTERNAL GENITALIA

BASIC INVESTIGATION

URINE ROUTINE

BLADDER URINE CULTURE/SENSITIVITY

COMPLETE BLOOD COUNT

RENAL FUNCTION TEST

IMAGING

PLAIN X RAY KUB

ULTRASONOGRAM KUB

CONTRAST CT KUB

STONE SIZE

LOCATION

INTRA OPERATIVE RECORDINGS

NO OF TRACTS

OPERATIVE TIME

PELVIC URINE C/S

STONE C/S

STONE ANALYSIS

POST OPERATIVE RECORDINGS

TEMPERATURE

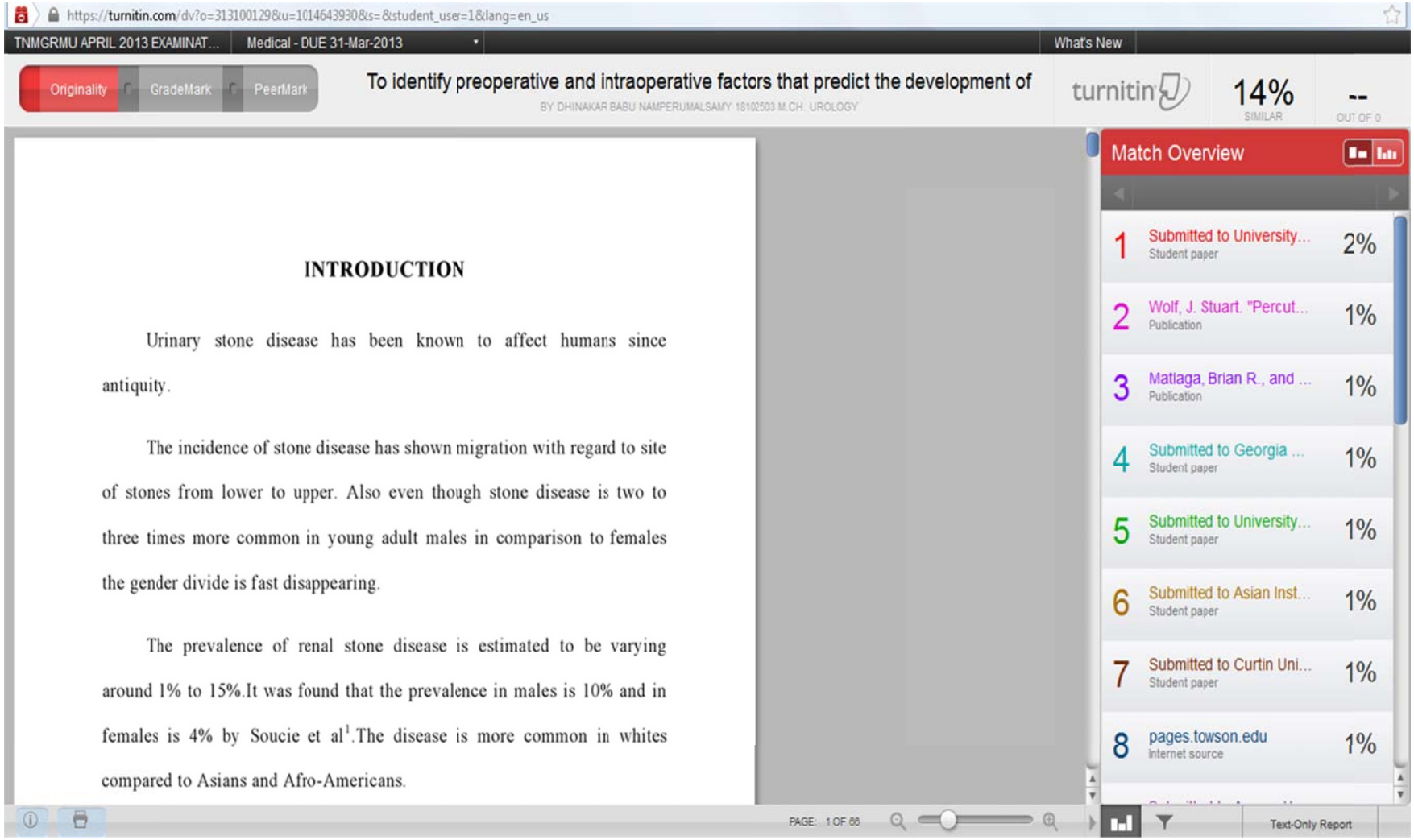
PULSE RATE

RESPIRATORY RATE

WBC COUNT

X RAY KUB

USG KUB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To identify preoperative and intraoperative factors that predict the development of
BY DHINAKAR BABU NAMPERUMALSAMY 18102503 M.CH. UROLOGY
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INTRODUCTION
Urinary stone disease has been known to affect humans since antiquity.
The incidence of stone disease has shown migration with regard to site of stones from lower to upper. Also even though stone disease is two to three times more common in young adult males in comparison to females the gender divide is fast disappearing.
The prevalence of renal stone disease is estimated to be varying around 1% to 15%.It was found that the prevalence in males is 10% and in females is 4% by Soucie et al[1].The disease is more common in whites compared to Asians and Afro-Americans.
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PAGE: 1 OF 66
Text-Only Report

MASTER CHART

S.No	Name	Age/ Sex	Pre Operative				Intra Operative				Blood transfusion	Post Operative			
			Sr. Creatinine	DM	Bladder Urine C/S	Stone Size	No. of Tracts	OP Time	Pelvic Urine C/S	Stone C/S		Temp	PR	RR	WBC
1	MILANGURANG	43/m	1.2	N	S	2.6	1	74	S	S	N	99	74	15	7800
2	KALIAMOORTHY	63/M	0.8	N	G	3	1	82	G	G	Y	103	98	28	14200
3	KAMALA	53/F	1.1	Y	G	2.5	1	65	S	S	N	98	76	14	7600
4	KUMUDHAVALLI	28/F	1.3	N	G	2.6	1	45	S	S	N	98.4	78	15	8900
5	KISHOREKUMAR	22/M	0.7	N	S	2.8	1	43	S	S	N	98.5	82	16	6700
6	SUSEELA	45/F	0.6	N	G	4	1	85	S	G	N	102	103	18	8000
7	RAVI	30/M	1.3	N	G	2.3	2	95	S	S	Y	99	88	14	5600
8	BASHEER	55/M	1.1	Y	G	3.7	1	65	G	S	N	101	88	14	12800
9	PITCHAI	65/M	1.8	Y	G	3.8	1	55	G	S	N	98.6	75	15	4600
10	PACHIAPPAN	65/M	1.2	Y	G	3.6	1	80	S	S	N	98.8	73	14	6200
11	DEVAKI	32/F	1	N	S	2.6	1	45	S	S	N	99	84	16	8300
12	SUBRAMANI	42/M	0.9	N	G	3.8	2	125	S	G	Y	104	112	19	10800
13	JEGANATHAN	31/M	0.7	N	S	2.6	1	65	S	S	N	98.3	75	13	4700
14	LAKSHMI	42/F	0.8	N	S	2.8	1	75	G	S	N	103	86	20	8800
15	BOOPALAN	48/M	0.9	N	G	3.2	1	80	S	S	N	97.8	84	13	6900
16	SENTHILNATHAN	45/M	0.6	N	G	3	1	110	S	S	N	98.2	76	14	7800
17	DAKSHINAMOORTHY	55/M	2.2	Y	S	2.7	1	95	S	G	Y	98.4	85	16	8600
18	ANNALAKSHMI	45/F	0.7	N	G	2.4	1	65	S	S	N	99	78	14	6800
19	VENKATESAN	23/M	2.4	N	G	2.8	2	110	G	G	Y	101.6	94	28	16200
20	ARUMUGAM	48/M	1.1	N	S	3.2	1	55	S	S	N	99	84	14	7500
21	USHARANI	47/F	1.2	N	G	2.8	1	60	G	G	N	102.4	86	16	14600
22	MUNIYAMMAL	55/F	1.3	N	G	3.2	1	115	G	S	N	98.4	110	20	13800
23	KUMAR	35/M	1.9	N	S	2.3	1	65	S	S	N	98.3	76	12	6200
24	BANUMATHI	37/F	1.2	N	G	2.4	1	70	G	S	N	98.6	76	12	4100

S.No	Name	Age/ Sex	Pre Operative				Intra Operative				Blood transfusion	Post Operative			
			Sr. Creatinine	DM	Bladder Urine C/S	Stone Size	No. of Tracts	OP Time	Pelvic Urine C/S	Stone C/S		Temp	PR	RR	WBC
25	JAMUNA	38/F	1	N	S	2.6	1	85	S	S	N	97.5	78	15	5200
26	MAHENDRAN	28/M	0.8	N	G	2.8	1	90	S	S	N	96.8	72	14	6900
27	BEEMAN	58/M	0.6	Y	S	3	2	125	S	G	N	98.7	78	15	5700
28	RAJAGANDHAM	50/F	1	N	G	2.6	1	55	S	G	N	99	76	13	8600
29	SANTHOSH	22/M	1.2	N	G	2.4	1	40	S	S	N	97.9	88	16	7500
30	RAVI	47/M	0.7	N	G	2.5	1	65	S	S	N	98	76	13	9800
31	NEELA	35/F	0.9	N	S	2.7	1	70	S	S	N	99	78	16	6100
32	DAKSHINAMOORTHY	57/M	1.1	Y	G	3.4	2	100	S	G	Y	103.8	88	26	12300
33	SAGADEVAN	62/M	1.9	N	S	2.2	1	55	S	S	N	97.4	72	14	5400
34	YACOB	60/M	1.2	Y	G	2.4	1	95	G	G	N	101.4	86	16	14700
35	SRINIVASAN	45/M	1.3	N	G	2.8	1	100	S	S	N	98.5	81	14	7500
36	RAJAN	49/M	0.7	N	S	3.8	1	110	G	G	N	103.6	96	14	6400
37	ARUMUGAM	62/M	0.9	Y	G	2.6	1	55	S	S	N	97.4	82	13	5100
38	SHANMUGAM	58/M	0.8	N	S	2.8	1	65	S	S	N	98.2	75	13	6400
39	JOTHI	58/F	1.8	Y	S	3.3	1	60	S	S	Y	101.2	88	18	8700
40	POOMATHU	47/F	1	N	S	2.4	1	55	S	S	N	99	78	16	6200
41	DAVAMANI	45/F	1.3	N	G	2.8	1	100	S	S	N	98.6	88	14	4200
42	SAKUNTHALA	51/F	1.4	Y	G	2.8	2	95	S	G	N	100.8	92	17	12800
43	MAHENDRAN	45/M	1.2	N	S	3.2	1	65	G	S	N	99	84	16	7800
44	DHANALAXMI	45/F	1.1	N	G	2.2	1	55	S	S	N	98.1	73	13	9800
45	BOOPALAN	41/M	0.9	Y	G	3	2	65	S	S	N	97.6	75	15	8900
46	DAYALAN	28/M	0.8	N	S	2.9	1	70	G	S	N	98.5	86	13	9700
47	KRISHNAMOORTHY	32/M	0.6	N	S	2.8	2	75	S	G	N	104.4	110	26	14600
48	SOMASUNDARAM	34/M	1.3	N	S	2.6	1	55	S	S	N	99	87	16	6300
49	PONNI	35/F	1.2	N	S	2.4	1	100	S	S	N	97	85	12	4300

S.No	Name	Age/ Sex	Pre Operative				Intra Operative				Blood transfusion	Post Operative			
			Sr. Creatinine	DM	Bladder Urine C/S	Stone Size	No. of Tracts	OP Time	Pelvic Urine C/S	Stone C/S		Temp	PR	RR	WBC
50	THIRUGNANASAMBANTHAM	40/M	0.6	N	S	3.9	1	95	S	G	Y	101	92	16	8800
51	KALAVANI	18/F	3.4	N	G	3.8	2	65	G	S	N	104.3	112	26	14600
52	AMSA	45/F	1.1	Y	G	3.4	1	100	G	G	N	103.2	98	18	13600
53	RAJAMOHAMMED	30/M	1	N	S	4.1	2	70	S	S	N	100.8	86	14	12600
54	MALAR	52/F	0.7	Y	G	2.6	1	55	S	S	N	98.3	87	12	5600
55	SOUNDARRAJAN	55/M	0.9	Y	G	2.6	1	45	S	S	N	97.7	64	14	7500
56	PERIYASAMY	49/M	2.6	N	G	2.4	1	40	S	G	Y	98	85	13	9300
57	RADHAKRISHNAN	31/M	1	N	S	2.8	1	55	G	S	N	97.6	86	13	5400
58	NALINI	26/F	1.1	N	S	2.8	1	90	S	S	N	98.9	78	15	8700
59	SAMBHANDHAM	59/M	2.6	Y	G	3.9	1	80	G	G	N	103.6	94	14	11600
60	KUMARASAMY	55/M	1.2	Y	S	2.7	1	65	S	S	N	97.8	65	13	8900
61	DAS	35/M	1.3	N	G	2.2	1	60	S	S	N	97.8	86	12	10200
62	VIJAYALAKSHMI	20/F	1	N	G	2.8	1	55	G	G	N	98.4	76	12	9800
63	MANIKANDAN	30/M	0.7	N	G	3.2	1	85	S	S	N	99	74	14	6800
64	MUNUSAMY	33/M	0.8	N	G	2.4	1	105	G	S	N	97.8	73	16	11200
65	RANGAN	57/M	2.7	Y	G	2.6	1	90	G	G	Y	98.9	87	12	5200
66	KATHAYEE	42/F	1.1	N	G	2.4	1	85	G	S	N	99	76	12	8200
67	NEELA	65/F	2.6	Y	S	2.8	1	65	S	G	Y	103.6	96	18	7800
68	DASSAMMAL	48/F	1.2	N	S	2.9	1	60	S	S	N	98	87	15	8600
69	AMEENA	50/F	1.3	Y	G	2.8	1	85	S	G	N	102.4	92	17	9700
70	RANJITHAM	55/F	1.8	Y	S	2.8	1	90	G	S	N	98.7	64	12	8600
71	NANDHINI	20/F	1.4	N	G	3	1	55	S	S	N	98.7	75	13	5600
72	SENTHIL	35/M	0.6	N	S	2.8	1	45	G	G	N	97.9	86	15	9800
73	ABDULRASHEED	37/M	0.7	Y	S	2.4	1	75	S	S	N	101.4	82	16	8200
74	MUTHU	36/M	0.9	N	S	2.8	1	60	S	S	N	99	76	12	6500

S.No	Name	Age/ Sex	Pre Operative				Intra Operative				Blood transfusion	Post Operative			
			Sr. Creatinine	DM	Bladder Urine C/S	Stone Size	No. of Tracts	OP Time	Pelvic Urine C/S	Stone C/S		Temp	PR	RR	WBC
75	RAJENDRAN	49/M	1.1	Y	G	2.4	1	55	S	S	N	97.8	86	18	5400
76	MOHAMMEDISMAIL	33/M	1.3	N	G	3.3	1	55	G	S	N	98.8	98	13	5700
77	GANDHIMATHI	60/F	2.7	Y	G	2.6	1	50	S	G	Y	98.9	76	14	9800
78	RAHUL	24/M	1.1	N	G	2.7	1	60	G	S	N	99	86	13	7500
79	CORNELIUS	30/M	1	N	S	2.4	1	65	S	S	N	98.9	76	18	10200
80	HARISH	33/M	0.6	N	S	3	1	70	G	S	N	99	76	14	10400
81	ASHOKKUMAR	42/M	2.3	Y	G	3.6	1	75	S	G	N	98	75	15	5600
82	MAHALAXMI	34/F	0.8	N	S	2.4	1	80	S	S	N	99	72	16	8200
83	MEENAKSHISUNDARAM	44/M	1.1	N	G	2.8	1	65	G	G	N	103.8	106	20	12600
84	SUNDARI	28/F	1.2	N	G	2.8	1	50	S	S	N	99	87	15	7300
85	RAJA	43/M	0.8	N	S	3.6	1	85	G	S	N	101.3	98	14	8900
86	SUGUMAR	29/M	1.3	N	S	2.4	1	60	G	G	N	98.7	76	14	9300
87	DHANALAKSHMI	42/F	0.6	N	S	2.4	1	65	S	S	N	97.6	87	16	10700
88	MALAR	52/F	1.1	Y	S	2.5	1	90	G	S	N	98	84	12	7600
89	PRAKASH	42/M	1	N	S	2.4	1	60	S	S	N	98.7	82	14	8700
90	ASOKAN	42/M	1	N	G	2.8	1	50	G	G	N	99	83	16	10900
91	GANESHKUMAR	29/M	0.8	N	S	2.4	1	55	S	S	N	98.6	76	14	9800
92	KAMATCHI	45/F	0.7	Y	G	2.8	1	60	G	S	N	99	82	13	7500
93	SASIKALA	24/F	0.6	N	S	5.1	2	90	S	G	Y	98.9	78	14	8300
94	LOGANATHAN	28/M	1.2	N	S	3.2	1	50	G	S	N	99.4	76	13	7200
95	PONNUSAMY	64/M	3.2	Y	G	3.7	1	55	G	S	Y	100.8	84	14	14400
96	KOWSALYA	46/F	1.3	N	S	2.4	1	45	S	S	N	99	75	14	8700
97	VEERAMMAL	60/F	2.4	Y	G	2.8	1	40	S	S	N	97.4	76	18	8600
98	MUTHU	45/M	1.1	N	S	2.6	1	50	G	G	N	98.6	87	13	8700
99	XAVIER	36/M	0.6	N	S	3.1	1	55	S	S	Y	98	76	15	6500

S.No	Name	Age/ Sex	Pre Operative				Intra Operative				Blood transfusion	Post Operative			
			Sr. Creatinine	DM	Bladder Urine C/S	Stone Size	No. of Tracts	OP Time	Pelvic Urine C/S	Stone C/S		Temp	PR	RR	WBC
100	LAKSHMI	42/F	0.9	Y	G	3.4	1	65	G	G	N	103.4	110	16	16600
101	ANTONY	36/M	0.8	N	G	2.8	1	60	S	S	N	98	75	12	5300
102	RAVISHANKAR	24/M	1.1	N	S	2.6	1	75	G	G	N	96.8	76	16	8700
103	CHITHRA	26/F	1.2	N	S	2.8	1	70	S	S	N	99	88	17	10900
104	ANNALAKSHMI	31/F	1	N	S	4.2	1	80	G	S	N	101.2	98	16	10400
105	PONNUSAMY	42/M	0.7	Y	S	2.4	1	60	G	S	N	99	76	15	5400
106	ABDULLAH	56/M	2.8	Y	S	2.5	1	55	S	G	N	104.2	110	24	9600
107	JOHN JOSEPH	36/M	0.6	N	S	2.8	1	90	S	G	N	99	87	14	7500
108	RAVEENDRAN	46/M	0.8	N	G	4.4	2	110	S	S	N	101.5	98	18	8200
109	SUBRAMANI	38/M	0.7	N	S	2.4	1	50	S	G	N	98.8	76	14	6500
110	MANICKAM	54/M	3.2	N	S	2.6	1	55	G	G	N	98	76	12	8700
111	SENTHAMARAI	36/F	1.1	N	S	3.3	1	65	S	G	N	101	105	14	6700
112	MANGALAM	42/F	1.2	Y	G	2.4	1	50	S	G	N	98	76	16	8900
113	SENGAM	48/F	1	Y	G	2.6	1	45	G	S	N	99	86	14	8700
114	KANAGAVALLI	36/F	0.6	N	G	2.6	1	55	S	G	N	98	76	16	8400
115	SHANMUGAM	52/M	0.8	N	S	3.8	1	80	S	G	N	103.4	92	16	7800
116	MARAGATHAM	38/M	0.9	Y	G	2.8	1	85	G	S	N	97.6	87	15	8900
117	MARGARET	27/F	1.2	N	S	2.4	1	70	G	G	N	98	76	14	9900
118	KALYANI	62/F	1.1	N	S	2.8	1	60	S	S	N	103.8	99	16	14600
119	MOHAMMED	43/M	1.3	Y	S	3.2	1	45	S	G	N	97.6	66	14	7300
120	JOSEPH	33/M	0.6	N	S	3.6	1	75	G	S	N	97.4	87	15	8300

Y-Yes, N-No, G- Growth, S- Sterile

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INTRODUCTION Urinary stone disease has been known to affect humans since antiquity. The incidence of stone disease has shown migration with regard to site of stones from lower to upper. Also even though stone disease is two to three times more common in young adult males in comparison to females the gender divide is fast disappearing. The prevalence of renal stone disease is estimated to be varying around 1% to 15%.It was found that the prevalence in males is 10% and in females is 4% by Soucie et al1.The disease is more common in whites compared to Asians and Afro-Americans. The peak age incidence of stones is in the fourth to sixth decades of life. Stones are more common in hot arid...